

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 Claim 1 (previously presented): For use with a node, a
2 method comprising:
3 a) accepting, using the node, status information
4 from at least two different kinds of routing
5 protocols;
6 b) composing, using the node, an aggregated message
7 including at least two indicators, each indicator
8 identifying a different one of the at least two
9 different kinds of routing protocols and the
10 corresponding status information from each of the at
11 least two different kinds of routing protocols as
12 data within the aggregated message; and
13 c) sending, using the node, the aggregated message
14 towards a neighbor node.

1 Claim 2 (previously presented): The method of claim 1
2 further comprising:
3 d) maintaining, using the node, a first timer for
4 tracking a send time interval, wherein the acts of
5 composing the aggregated message and sending the
6 aggregated message are performed after expiration of
7 the first timer; and
8 e) restarting, using the node, the first timer
9 after the aggregated message is sent.

1 Claim 3 (previously presented): The method of claim 2
2 wherein the aggregated message further includes a dead
3 time interval, and wherein the send time interval is less
4 than the dead time interval.

1 Claim 4 (previously presented): The method of claim 2
2 wherein the aggregated message further includes a dead
3 time interval, and wherein the send time interval is no
4 more than one third of the dead time interval.

1 Claim 5 (original): The method of claim 2 wherein the
2 send time interval is less than one second.

1 Claim 6 (original): The method of claim 2 wherein the
2 send time interval is less than 100 msec.

1 Claim 7 (previously presented): The method of claim 1
2 wherein the aggregated message further includes a dead
3 time interval.

1 Claim 8 (previously presented): The method of claim 1
2 wherein the act of sending the aggregated message
3 includes providing the aggregated message in an Internet
4 protocol packet.

1 Claim 9 (previously presented): The method of claim 8
2 wherein the act of sending the aggregated message towards
3 the neighbor node includes setting a destination address
4 in the Internet protocol packet to a multicast address
5 associated with routers that support aggregated protocol
6 liveness.

1 Claim 10 (previously presented): The method of claim 1
2 wherein the neighbor node has at least one routing
3 protocol peering with at least one of the at least two
4 routing protocols.

1 Claim 11 (previously presented): The method of claim 1
2 wherein the status information includes a routing
3 protocol state selected from a group of routing protocols
4 states consisting of (A) protocol up, (B) protocol down,
5 (C) protocol not reporting, and (D) protocol restarting.

1 Claim 12 (previously presented): For use with a node, a
2 method comprising:
3 a) receiving, using the node, an aggregated message
4 including
5 i) for a first set of at least two different
6 kinds of routing protocols of a neighbor node,
7 at least two indicators, each indicator
8 identifying a different one of the at least two
9 different kinds of routing protocols and
10 corresponding status information for each of
11 the protocols of the first set of the at least
12 two different kinds of routing protocols as
13 data within the aggregated message, and
14 ii) a time interval; and
15 b) updating, using the node, neighbor node protocol
16 status information using the aggregated message.

1 Claim 13 (previously presented): The method of claim 12
2 wherein the act of updating neighbor node protocol status
3 information includes
4 i) setting, using the node, a first timer to
5 the time interval and starting the first timer,
6 ii) if the first timer expires, setting, using
7 the node, the status of each of the protocols
8 of the neighbor node to down, and

9 iii) if a further message, sourced from the
10 neighbor node, and including
11 A) for a second set of at least two
12 protocols, at least two indicators, each
13 indicator identifying the at least two
14 routing protocols and corresponding status
15 information for each of the routing
16 protocols of the second set, and
17 B) a new time interval,
18 is received then, resetting, using the node,
19 the first timer to the new time interval and
20 restarting the first timer.

1 Claim 14 (original): The method of claim 13 wherein each
2 of the time interval and the new time interval is less
3 than one second.

1 Claim 15 (previously presented): The method of claim 12
2 wherein the status information includes a routing
3 protocol state selected from a group of routing protocols
4 states consisting of (A) protocol up, (B) protocol down,
5 (C) protocol not reporting, and (D) protocol restarting.

1 Claim 16 (previously presented): The method of claim 13
2 wherein the act of updating neighbor node routing
3 protocol status information further includes
4 iv) if the further message is received then,
5 in addition to resetting the first timer to the
6 new time interval and restarting the first
7 timer, further
8 A) determining, using the node, whether
9 the first set of at least two routing

10 protocols is the same as the second set of
11 at least two routing protocols,
12 B) if the first set of at least two
13 routing protocols is determined to be the
14 same as the second set of at least routing
15 two protocols, then for each of the at
16 least two routing protocols of both the
17 first and second sets having a changed
18 status, informing, using the node, a
19 locally running instance of the routing
20 protocol of the changed status of its peer
21 routing protocol of the neighbor node, and
22 C) if the first set of at least two
23 routing protocols is determined to be
24 different from the second set of at least
25 two routing protocols, then
26 1) for any routing protocol in the
27 second set but not in the first set,
28 informing, using the node, a locally
29 running instance of the routing
30 protocol of the status indicated in
31 the further message of its peer
32 routing protocol of the neighbor
33 node, and
34 2) for any routing protocol in the
35 first set but not in the second set,
36 informing, using the node, a locally
37 running instance of the routing
38 protocol that the status of its peer
39 routing protocol of the neighbor node
40 is down.

1 Claim 17 (previously presented): The method of claim 16
2 wherein each of the aggregated message and the further
3 message include an indication of a relative message age,
4 and wherein the act of updating neighbor node routing
5 protocol status information includes,
6 iv) if the further message is received then,
7 in addition to resetting the first timer to the
8 new time interval and restarting the first
9 timer, further
10 A) determining, using the node, whether
11 the further message is younger than the
12 aggregated message, and
13 B) if it is determined that the further
14 message is not younger than the aggregated
15 message, then discarding, using the node,
16 the further message.

1 Claim 18 (previously presented): The method of claim 13
2 wherein each of the aggregated message and the further
3 message include an indication of a relative message age,
4 and wherein the act of updating neighbor node routing
5 protocol status information includes,
6 iv) if the further message is received then,
7 in addition to resetting the first timer to the
8 new time interval and restarting the first
9 timer, further
10 A) determining, using the node, whether
11 the further message is younger than the
12 aggregated message, and
13 B) if it is determined that the further
14 message is not younger than the aggregated

15 message, then discarding, using the node,
16 the further message.

1 Claim 19 (previously presented): A method for monitoring
2 liveness of multiple protocols, the method comprising:
3 a) determining, at a first node, status information
4 for at least two different kinds of routing
5 protocols;
6 b) sending, from the first node, an aggregated
7 message including at least two indicators, each
8 indicator identifying a different one of the at
9 least two different kinds of routing protocols and
10 the corresponding determined status information for
11 the at least two different kinds of routing
12 protocols as data within the aggregated message to a
13 second node;
14 c) receiving, at the second node, the aggregated
15 message; and
16 d) updating, by the second node, first node routing
17 protocol status information using the aggregated
18 message.

1 Claim 20 (previously presented): The method of claim 19
2 wherein the aggregated message further includes a first
3 time interval, and wherein the act of updating neighbor
4 node routing protocol status information includes
5 i) setting a timer to the first time interval;
6 ii) starting the timer;
7 iii) determining whether or not a further
8 message including routing protocol status
9 information is received from the first node by

10 the second node before the expiration of the
11 timer; and
12 iv) if it is determined that a further message
13 including routing protocol status information
14 is not received from the first node by the
15 second node before the expiration of the timer,
16 then informing peer routing protocols of the
17 second node that the at least two routing
18 protocols of the first node are down.

1 Claim 21 (previously presented): The method of claim 19
2 wherein the status information includes a routing
3 protocol state selected from a group of protocols states
4 including at least (A) protocol up, (B) protocol down,
5 (C) protocol not reporting, and (D) protocol restarting.

1 Claim 22 (previously presented): A machine-readable
2 medium having stored thereon a machine readable
3 aggregated message comprising:
4 a) at least two indicators, each indicator
5 identifying a different one of at least two
6 different kinds of routing protocols of a node
7 stored as data within the aggregated message;
8 b) status information, for the at least two
9 different kinds of routing protocols of the node, of
10 a state of each of the at least two routing
11 protocols stored as data within the aggregated
12 message; and
13 c) a dead interval.

1 Claim 23 (previously presented): The machine-readable
2 medium of claim 22 wherein the status information

3 indicates a routing protocol state selected from a group
4 of protocols states consisting of (A) protocol up, (B)
5 protocol down, (C) protocol not reporting, and (D)
6 protocol restarting.

1 Claim 24 (original): The machine-readable medium of
2 claim 22 further comprising:

3 c) an identifier of the node.

1 Claim 25 (original): The machine-readable medium of
2 claim 24 wherein the node is a router and wherein the
3 identifier is a router identifier.

1 Claim 26 (original): The machine-readable medium of
2 claim 22 further comprising:

3 c) an interface index.

1 Claim 27 (previously presented): For use with a node,
2 apparatus comprising:

3 a) at least one processor;
4 b) at least one input device; and
5 c) at least one storage device storing
6 processor-executable instructions which, when
7 executed by one or more processors, perform a method
8 including
9 i) accepting status information from at least
10 two different kinds of routing protocols,
11 ii) composing, using the node, an aggregated
12 message including at least two indicators, each
13 indicator identifying a different one of the at
14 least two different kinds of routing protocols
15 and the corresponding status information from

16 each of the at least two different kinds of
17 routing protocols as data within the aggregated
18 message, and
19 iii) sending the aggregated message towards a
20 neighbor node.

1 Claim 28 (previously presented): The apparatus of claim
2 27 wherein the method further includes
3 iv) maintaining a first timer for tracking a send
4 time interval, wherein the act of composing the
5 aggregated message and sending the aggregated
6 message compose and send the aggregated message
7 after expiration of the first timer, and
8 v) restarting the first timer after the aggregated
9 message is sent.

1 Claim 29 (previously presented): The apparatus of claim
2 28 wherein the aggregated message further includes a dead
3 time interval, and wherein the send time interval is less
4 than the dead time interval.

1 Claim 30 (previously presented): The apparatus of claim
2 28 wherein the aggregated message further includes a dead
3 time interval, and wherein the send time interval is no
4 more than one third of the dead time interval.

1 Claim 31 (previously presented): The apparatus of claim
2 28 wherein the send time interval is less than one
3 second.

1 Claim 32 (previously presented): The apparatus of claim
2 28 wherein the send time interval is less than 100 msec.

1 Claim 33 (previously presented): The apparatus of claim
2 27 wherein the aggregated message further includes a dead
3 time interval.

1 Claim 34 (previously presented): The apparatus of claim
2 27 wherein the act of sending the aggregated message
3 includes providing the aggregated message in an Internet
4 protocol packet.

1 Claim 35 (previously presented): The apparatus of claim
2 34 wherein the act of sending the aggregated message
3 includes setting a destination address in the Internet
4 protocol packet to a multicast address associated with
5 routers that support aggregated routing protocol
6 liveness.

1 Claim 36 (previously presented): The apparatus of claim
2 27 wherein the neighbor node has at least one protocol
3 peering with at least one of the at least two protocols.

1 Claim 37 (previously presented): The apparatus of claim
2 27 wherein the status information includes a routing
3 protocol state selected from a group of protocols states
4 consisting of (A) protocol up, (B) protocol down, (C)
5 protocol not reporting, and (D) protocol restarting.

1 Claim 38 (previously presented): For use with a node,
2 apparatus comprising:
3 a) at least one processor;
4 b) at least one input device; and
5 c) at least one storage device storing
6 processor-executable instructions which, when

7 executed by one or more processors, perform a method
8 including
9 i) receiving, using the at least one input, an
10 aggregated message including
11 A) for a first set of at least two
12 different kinds of routing protocols of a
13 neighbor node, at least two indicators, each
14 indicator identifying a different one of the at
15 least two different kinds of routing protocols
16 and corresponding status information for each
17 of the protocols of the first set of the at
18 least two different kinds of routing protocols
19 as data within the aggregated message, and
20 B) a time interval, and
21 ii) updating neighbor node protocol status
22 information using the aggregated message.

1 Claim 39 (previously presented): The apparatus of claim
2 38 wherein the act of updating neighbor node protocol
3 status information includes
4 A) setting a first timer to the time interval
5 and starting the first timer,
6 B) setting the status of each of the routing
7 protocols of the neighbor node to down if the
8 first timer expires, and
9 C) if a further message, sourced from the
10 neighbor node, and including
11 1) for a second set of at least two
12 protocols, at least two indicators, each
13 indicator identifying the at least two
14 routing protocols and corresponding status

15 information for each of the routing
16 protocols of the second set, and
17 2) a new time interval,
18 is received, resetting the first timer to the
19 new time interval and restarting the first
20 timer.

1 Claim 40 (previously presented): The apparatus of claim
2 39 wherein each of the time interval and the new time
3 interval is less than one second.

1 Claim 41 (previously presented): The apparatus of claim
2 38 wherein the status information includes a routing
3 protocol state selected from a group of protocols states
4 consisting of (A) protocol up, (B) protocol down, (C)
5 protocol not reporting, and (D) protocol restarting.

1 Claim 42 (previously presented): The apparatus of claim
2 39 wherein the act of updating neighbor node routing
3 protocol status information further includes
4 D) determining whether the first set of at
5 least two routing protocols is the same as the
6 second set of at least two protocols,
7 E) if the first set of at least two routing
8 protocols is determined to be the same as the
9 second set of at least two routing protocols,
10 then for each of the at least two routing
11 protocols of both the first and second sets
12 having a changed status, informing a locally
13 running instance of the routing protocol of
14 the changed status of its peer routing
15 protocol of the neighbor node, and

16 F) if the first set of at least two routing
17 protocols is determined to be different from
18 the second set of at least two routing
19 protocols,
20 1) for any routing protocol in the second
21 set but not in the first set, informing a
22 locally running instance of the routing
23 protocol of the status indicated in the
24 further message of its peer routing
25 protocol of the neighbor node, and
26 2) for any routing protocol in the first
27 set but not in the second set, informing a
28 locally running instance of the routing
29 protocol that the status of its peer
30 routing protocol of the neighbor node is
31 down.

1 Claim 43 (previously presented): The apparatus of claim
2 42 wherein each of the aggregated message and the further
3 message include an indication of a relative message age,
4 and wherein the act of updating neighbor node routing
5 protocol status information includes,

6 D) determining whether the further message is
7 younger than the aggregated message, and

8 E) if it is determined that the further
9 message is not younger than the aggregated
10 message, then discarding the further message.

11

1 Claim 44 (previously presented): The apparatus of claim
2 39 wherein each of the aggregated message and the further
3 message include an indication of a relative message age,

4 and wherein the act of updating neighbor node routing
5 protocol status information includes,
6 D) determining whether the further message is
7 younger than the aggregated message, and
8 E) if it is determined that the further
9 message is not younger than the aggregated
10 message, then discarding the further message.

1 Claim 45 (previously presented): A system comprising:
2 a) a first node adapted to
3 i) determine status information for at least
4 two different kinds of routing protocols, and
5 ii) send an aggregated message including at
6 least two indicators, each indicator
7 identifying a different one of the at least two
8 different kinds of routing protocols and the
9 corresponding determined status information for
10 the at least two different kinds of routing
11 protocols as data within the aggregated message
12 to a second node; and
13 b) the second node adapted to
14 i) receive the aggregated message; and
15 ii) update first node routing protocol status
16 information using the aggregated message.

1 Claim 46 (previously presented): The system of claim 45
2 wherein the aggregated message further includes a first
3 time interval, and wherein the act of updating the first
4 node routing protocol status information includes
5 A) setting a timer to the first time
6 interval;
7 B) starting the timer;

8 C) determining whether or not a further
9 message including routing protocol status
10 information is received from the first
11 node by the second node before the
12 expiration of the timer; and
13 D) if it is determined that a further
14 message including routing protocol status
15 information is not received from the first
16 node by the second node before the
17 expiration of the timer, then informing
18 peer routing protocols of the second node
19 that the at least two routing protocols of
20 the first node are down.

1 Claim 47 (previously presented): The system of claim 46
2 wherein the status information includes a routing
3 protocol state selected from a group of protocols states
4 including at least (A) protocol up, (B) protocol down,
5 (C) protocol not reporting, and (D) protocol restarting.

1 Claim 48 (previously presented): The method of claim 1
2 wherein the status information is local routing protocol
3 status information.

1 Claim 49 (previously presented): The method of claim 1
2 wherein the status information is local status
3 information and wherein each of the at least two
4 different kinds of routing protocols is being run locally
5 on the node.

1 Claim 50 (previously presented): The method of claim 1
2 wherein the status information of at least one of the at

3 least two different kinds of routing protocols included
4 in the aggregated message includes a routing protocol
5 state set to protocol not reporting.

1 Claim 51 (previously presented): The method of claim 1
2 wherein the status information of at least one of the at
3 least two different kinds of routing protocols included
4 in the aggregated message includes a routing protocol
5 state set to protocol restarting.

1 Claim 52 (previously presented): The method of claim 12
2 wherein the status information of at least one of the at
3 least two different kinds of routing protocols included
4 in the first set of at least two different kinds of
5 routing protocols included within the aggregated message
6 includes a routing protocol state set to protocol not
7 reporting.

1 Claim 53 (previously presented): The method of claim 12
2 wherein the status information of at least one of the at
3 least two different kinds of routing protocols included
4 in the first set of at least two different kinds of
5 routing protocols included within the aggregated message
6 includes a routing protocol state set to protocol
7 restarting.

1 Claim 54 (previously presented): The method of claim 1
2 wherein a first one of the at least two indicators
3 identifies a first kind of routing protocol from a group
4 of routing protocols consisting of (A) Border Gateway
5 Protocol (BGP), (B) Intermediate system to intermediate
6 system (IS-IS), (C) Open Shortest Path First - Version 2

7 (OSPF v2), (D) Open Shortest Path First -Version 3 (OSPF
8 v3), (E) Routing Information Protocol Version 1/Version 2
9 (RIP v1/v2), (F) Routing Information Protocol next
10 generation (RIP-ng), (G) Protocol-Independent Multicast
11 (PIM), (H) Distance Vector Multicast Routing Protocol
12 (DVMRP), (I) Label Distribution Protocol (LDP), (J)
13 Resource Reservation Protocol (RSVP) and (K) Link
14 Management Protocol (LMP), and
15 wherein a second one of the at least two indicators
16 identifies a second kind of routing protocol, which is
17 different from the first kind of routing protocol
18 identified, from a group of routing protocols consisting
19 of (A) Border Gateway Protocol (BGP), (B) Intermediate
20 system to intermediate system (IS-IS), (C) Open Shortest
21 Path First - Version 2 (OSPF v2), (D) Open Shortest Path
22 First -Version 3 (OSPF v3), (E) Routing Information
23 Protocol Version 1/Version 2 (RIP v1/v2), (F) Routing
24 Information Protocol next generation (RIP-ng), (G)
25 Protocol-Independent Multicast (PIM), (H) Distance Vector
26 Multicast Routing Protocol (DVMRP), (I) Label
27 Distribution Protocol (LDP), (J) Resource Reservation
28 Protocol (RSVP) and (K) Link Management Protocol (LMP).

1 Claim 55 (previously presented): The method of claim 12
2 wherein a first one of the at least two indicators
3 identifies a first kind of routing protocol from a group
4 of routing protocols consisting of (A) Border Gateway
5 Protocol (BGP), (B) Intermediate system to intermediate
6 system (IS-IS), (C) Open Shortest Path First - Version 2
7 (OSPF v2), (D) Open Shortest Path First -Version 3 (OSPF
8 v3), (E) Routing Information Protocol Version 1/Version 2
9 (RIP v1/v2), (F) Routing Information Protocol next

10 generation (RIP-ng), (G) Protocol-Independent Multicast
11 (PIM), (H) Distance Vector Multicast Routing Protocol
12 (DVMRP), (I) Label Distribution Protocol (LDP), (J)
13 Resource Reservation Protocol (RSVP) and (K) Link
14 Management Protocol (LMP), and
15 wherein a second one of the at least two indicators
16 identifies a second kind of routing protocol, which is
17 different from the first kind of routing protocol
18 identified, from a group of routing protocols consisting
19 of (A) Border Gateway Protocol (BGP), (B) Intermediate
20 system to intermediate system (IS-IS), (C) Open Shortest
21 Path First - Version 2 (OSPF v2), (D) Open Shortest Path
22 First -Version 3 (OSPF v3), (E) Routing Information
23 Protocol Version 1/Version 2 (RIP v1/v2), (F) Routing
24 Information Protocol next generation (RIP-ng), (G)
25 Protocol-Independent Multicast (PIM), (H) Distance Vector
26 Multicast Routing Protocol (DVMRP), (I) Label
27 Distribution Protocol (LDP), (J) Resource Reservation
28 Protocol (RSVP) and (K) Link Management Protocol (LMP).

1 Claim 56 (new): The method of claim 1 wherein the at
2 least two different kinds of routing protocols for which
3 the status information has been accepted have been
4 established prior to accepting the status information
5 from the at least two different kinds of routing
6 protocols.

1 Claim 57 (new): The method of claim 12 wherein the at
2 least two different kinds of routing protocols for which
3 the corresponding status information has been received in
4 the aggregated message have been established prior to
5 receiving the aggregated message.